

# PATENT SPECIFICATION

DRAWINGS ATTACHED

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## COMPLETE SPECIFICATION

### Driving Gear for a Ship's Mooring Line

We, ISHIKAWAJIMA - HARIMA JUKOGYO KABUSHIKI KAISHA, a company organized and existing under the laws of Japan, residing at No. 4, 2-chome, Ote-machi, Chiyoda-ku, Tokyo-to, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—  
10 This invention relates to driving gear for ship's mooring lines.

On entering port, ships can be moored to the quay by tying the mooring lines to the bitts on the quay with the help of a rope ferry. In the case of large ships, mooring lines are very heavy, requiring much labour, and as they are usually kept under the deck, they must be brought up on the deck through a rope hatch before the ship enters port.

20 This invention consists in driving gear for a ship's mooring line, comprising a driving roller arranged to be rotated by a motor and a follower arranged to bias the mooring line against the driving roller and exert sufficient pressure on the mooring line to cause the mooring line to be gripped between the driving roller and the follower.

This invention also consists in a method of preparing a ship for mooring including using the driving gear of the invention to drive a mooring line.

If appropriate, the driving roller can be in the form of a sheave. It is preferred that the follower be a roller. The follower may be spring biased against the driving roller, or in other arrangements, may be arranged to be biased against the driving roller by a jamming action.

40 In using the driving gear, the mooring line will normally be led from for instance a capstan to the driving roller, and the driving gear can be arranged to be adjacent the capstan, the gear including a series of idler rollers arranged to pass the mooring line from

the driving roller to an exit from the driving gear. In this manner, the exit can be suitably orientated for passing the mooring line on to say a fairlead or mooring pipe. If the capstan is below the deck, the series of idler rollers may be arranged in a curve for passing the mooring line up through the deck and bending it from a generally vertical direction to a generally horizontal direction.

The driving gear may be arranged to be pivotable about a vertical axis, so that the driving roller can be suitably orientated with respect to the fairlead or mooring pipe.

The invention will be further described, by way of example, with reference to the accompanying drawings, of which:—

Figure 1 is a side view of an embodiment of the present invention when the winch and winding drum are installed under the deck;

Figure 2 is a plan of the embodiment of Figure 1;

Figure 3 shows another embodiment of the invention with the winch and winding drum under the deck;

Figure 4 is a cross-section along the line IV—IV in Figure 3;

Figure 5 shows the mooring arrangement when the gear shown in Figures 1 or 3 is set up on the after deck;

Figure 6 is a side view of Figure 5, showing part of the arrangement;

Figure 7 is a side view of a third embodiment of the invention where the winch and winding drum are located on the deck;

Figure 8 is a plan of the embodiment of Figure 7;

Figure 9 is a cross-section of the embodiment of Figure 7 along the line IX—IX; and

Figure 10 shows how to stretch the mooring lines in the case where the gear shown in Figures 7 to 9 is installed on the after deck.

From the engineering viewpoint, it is advisable to use different embodiments in different situations, for instance with the winch

and winding drum located under the deck or on the deck; the embodiments illustrated in Figures 1 to 6 are adapted for a large ship where the winch and winding drum are installed under the deck, while the embodiment illustrated in Figures 7 to 10 is suited to the latter case.

In Figures 1 and 2, a rotatable body 1 consists of identical halves, joined together with bolts 2. The body 1 is rotationally supported by a support 3 having a bearing 4 and having an O-ring seal 5 fitted to make it water-tight. The support 3 is fixed over a hole in the deck 6 of sufficient size to receive the lower end portion of the body 1.

Sheaves 7 and guide rollers 8 are mounted in the body 1 and a mooring line 13 runs over the sheaves 7 and associated sheaves 9 and 10, and further down to the drum of a winch 14 (see Figure 6).

The associated sheaves 9 and 10 hoist the line 13; the driving sheave 10 is mounted on a fixed shaft 15 while the axle 16 of the follower sheave 9 is spring-loaded for gripping the line 13 between the two sheaves 9 and 10.

The driving sheave 10 is coupled with a motor 12 (for example a hydraulic motor) and is arranged to hoist the line 13 from the winch 14 at such a speed as to keep the line 13 taut between the sheave 10 and the winch 14 during paying out.

A water-tight cover 50 is fitted at the end of the body and the opening can be closed to keep water out of the interior of the body 1 and the inside of the ship when the gear is not in operation.

The embodiment 4 shown in Figures 1 and 2 is installed on the deck 6; the direction in which the line 13 is to extend can be predetermined, and the line 13 be brought to the ship's side accordingly. On entering port, the winch 14 is rotated in the reverse direction and the motor 12 is turned at an appropriate speed in order to hoist out the line 13 by means of the sheaves 9 and 10, and when the line 13 is passed through fairleads 17 or mooring pipes 18 and tied to the bollard or bitt on the quay, the winch 14 is rotated in the wind-in direction, and the line 13, although pressed against the flight of idler sheaves 7, can be re-wound to pull the ship to the quay, because the lines can be positioned as shown in Figure 5. At this time the sheaves 9 and 10, although pressed against the line 13 by their springs, have no significant effect on the tension of the line 13 because the motor 12 is arranged to be able to turn idly, when not powered.

In the embodiment of Figures 3 and 4, a driving sheave 19 is rigidly fixed onto a shaft 21 drivable by motor 22 through reduction gearing 23. The mooring lines 13, after coming up through the deck 6, passes between the driving sheave 19 and an associa-

ted follower sheave 20, which is pressed against the line 13 by means of springs 24 so that the line 13 can be gripped by the sheaves 19 and 20.

A casing 26 houses the sheaves 19 and 20, and is mounted on a base 25 on the deck 6, allowing the casing 26 to pivot around a vertical axis C. The casing 26 has a lid 27 to close the casing when the gear is not operation, to keep water out of the interior of the casing and of the ship.

When the motor 22 runs, the driving sheave 19 rotates in the direction of the arrow *a*. The line 13 is pressed against the driving sheave 19 by the follower sheave 20, and is thrust forward in the direction indicated by the arrow *d*; thus, the line 13 runs up from under the deck 6. The follower sheave 20 turns in the direction of the arrow *b* as the line 12 runs out.

As shown in Figures 5 and 6, embodiments of Figures 3 and 4 are positioned on the deck 6 while the winches 14 and winding drums are installed under the deck 6. When the motor 22 drives the sheaves 19, the lines 13 are hoisted up on to the deck 6, and the casings 26 can turn on the bases 25 so that the casings 26 face in the correct direction.

In the embodiment shown in Figures 7—10, power can be transmitted from motor 31 by means of gear wheels 32 and 33 to a shaft 30, to which is rigidly fixed a driving roller 28 mounted on a body 35. The body 35 can be pivoted about a pivot 36, and the body 35 has a wheel 37 on the side opposite to the pivot 36, running on the deck 34. A housing 38 is mounted on the body 35 so that it can pivot about an axle 39; the housing 38 has a follower 29 whose axle 40 is pivotally fitted and can freely travel along upper and lower guide slots 41, while rolling along upper and lower rails 44. A handle 42 is fixed on the housing 38 and pivots about an axle 43. When the handle 42 is pulled in the direction of the arrow *e*, it displaces and comes off its stop which is integral with the housing 38 and thereby moves the housing 38 in the direction of the arrow *f* carrying the follower 29 away from the driving roller 28, allowing the insertion of the line 13 between the roller 28 and follower 29.

The surfaces of the rollers may be covered with resilient material such as rubber which allows the line 13 to sink somewhat in the surfaces of the rollers to assure a good grip on the line 13.

When the end of the mooring line 13 has been inserted between the driving roller 28 and the follower 29, the motor 31 is started, and the driving roller 28 turns in the direction of the arrow *g*, thrusting out the line 13. This makes the follower 29 turn and at the same time the axle 40 of the follower 29 rolls along the rails 44 and travels in the slots 41 in the direction of the arrow *h*, press-

ing the line 13 against the driving roller 28, which makes the rollers 28 and 29 grip the line 13 securely.

5 In the case of re-winding, a little pull at the line 13 in the direction of the arrow *i* makes the axle 40 of the follower 29 slide back in the direction of the arrow *j*, loosing the line 13 from the grip of the rollers 28 and 29; and allowing the line 13 to be pulled  
10 freely in the direction of the arrow *i*.

As shown in Figure 10, the embodiment C is positioned in front of the fairlead 45 on the deck 34, allowing it to pivot about the axle 36. The line 13, after being fixed to  
15 the drum of a capstan 46 or the dike, is passed between the driving roller 28 and the roller 29, and through the fairlead 45 out of the ship.

After the capstan is declutched, the motor  
20 31 is started to thrust out the line 13, using the roller 28 and follower 29. When enough of the line 13 is out, the motor 31 is stopped, and the end of the line 13 is tied to a bitt on the quay. The capstan 46 is then clutched  
25 in in order to wind up the line 13, which is then freed of the grip of the roller 28 and follower 29.

The use of the present invention can lessen the laborious work experienced in handling  
30 heavy mooring lines can increase efficiency and dependability by using mechanical power while consuming much less labour. In addition, embodiments of the invention can have a simple construction, be easy to install and  
35 handle whilst having dependable performance, and be cheap to manufacture and use.

The embodiment shown in Figures 1 and 2 can be constructed very compactly because the tension of the mooring line, whatever the  
40 direction, can be divided between several sheaves arranged in a large radius. Low production costs and exact performance in driving out the line can be achieved.

rotated by a motor and a follower arranged to bias the mooring line against the driving roller and exert sufficient pressure on the mooring line to cause the mooring line to be gripped between the driving roller and the follower.

2. Driving gear as claimed in claim 1 wherein the follower is a roller.

3. Driving gear as claimed in either claim 1 or claim 2 wherein the follower is spring biased against the driving roller.

4. Driving gear as claimed in either claim 1 or claim 2 wherein the follower is arranged to be biased against the driving roller by a jamming action.

5. Driving gear as claimed in any one of the preceding claims and including a series of idler rollers arranged to pass the mooring line from the driving roller to an exit from the driving gear.

6. Driving gear as claimed in claim 5 wherein the series of idler rollers is arranged in a curve for passing the mooring line up through the deck of a ship and bending it from a generally vertical direction to a generally horizontal direction.

7. Driving gear as claimed in any one of the preceding claims and arranged to be pivotable about a vertical axis.

8. Driving gear substantially as herein described with reference to, and as shown in, Figures 1, 2, 5 and 6 of the accompanying drawings.

9. Driving gear substantially as herein described with reference to, and as shown in, Figures 3—6 of the accompanying drawings.

10. Driving gear substantially as herein described with reference to, and as shown in, Figures 7—10 of the accompanying drawings.

11. A method of preparing a ship for mooring comprising using driving gear as claimed in any one of the preceding claims to drive a mooring line.

#### WHAT WE CLAIM IS:—

- 45 1. Driving gear for a ship's mooring line comprising a driving roller arranged to be

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Agents for the Applicant(s).

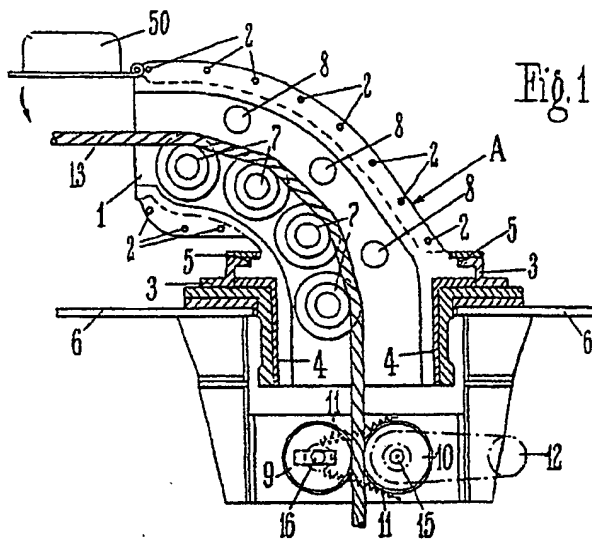


Fig. 1

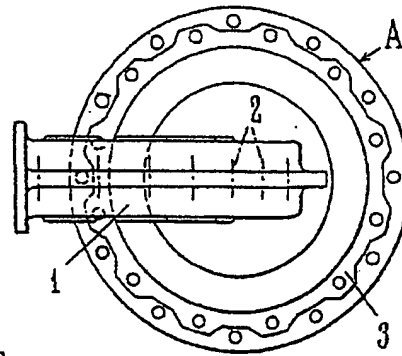


Fig. 2.

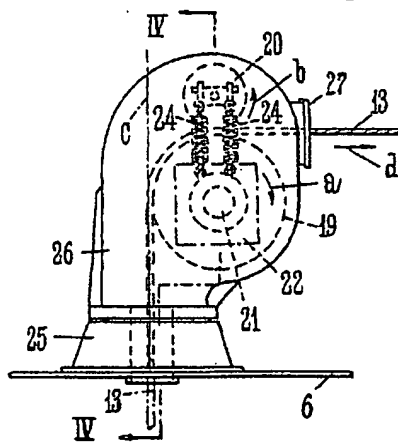


Fig. 3.

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3 SHEETS

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Sheets 1 & 2

Fig. 1

6

12

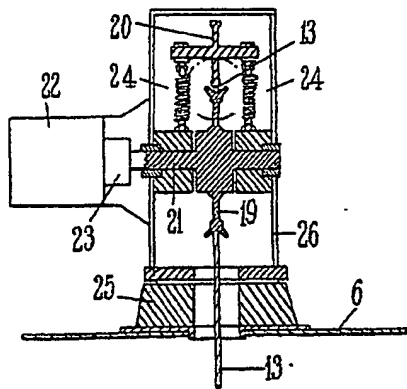
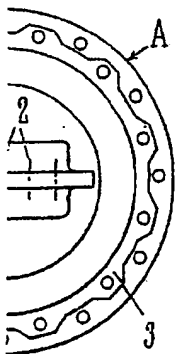


Fig. 4

Fig. 5.

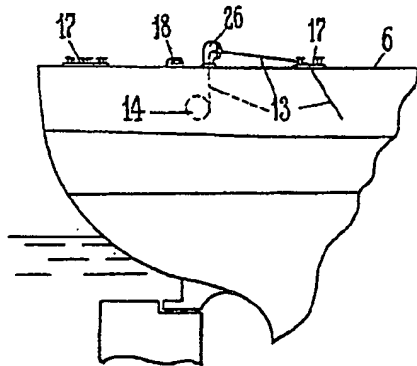
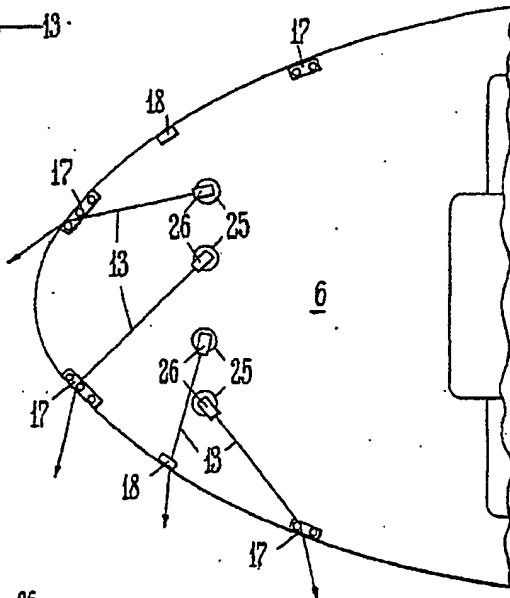


Fig. 6.

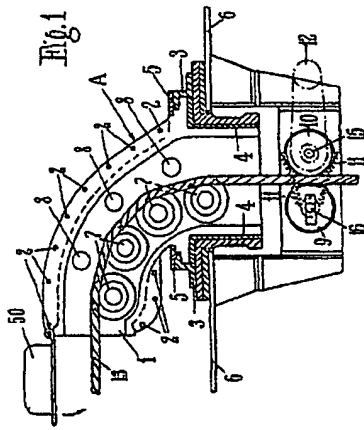


Fig. 1

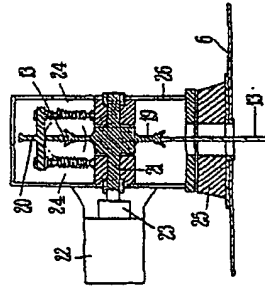


Fig. 4

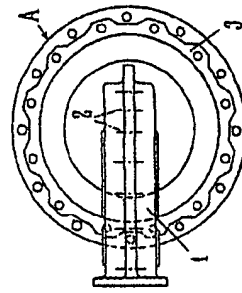


Fig. 2

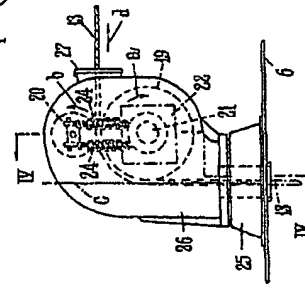


Fig. 3

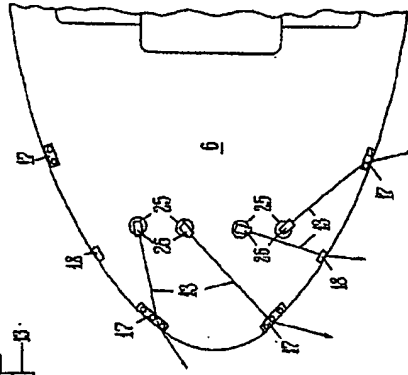


Fig. 5

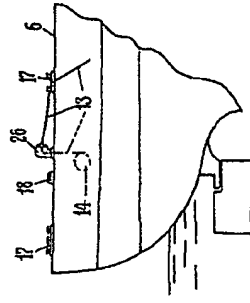
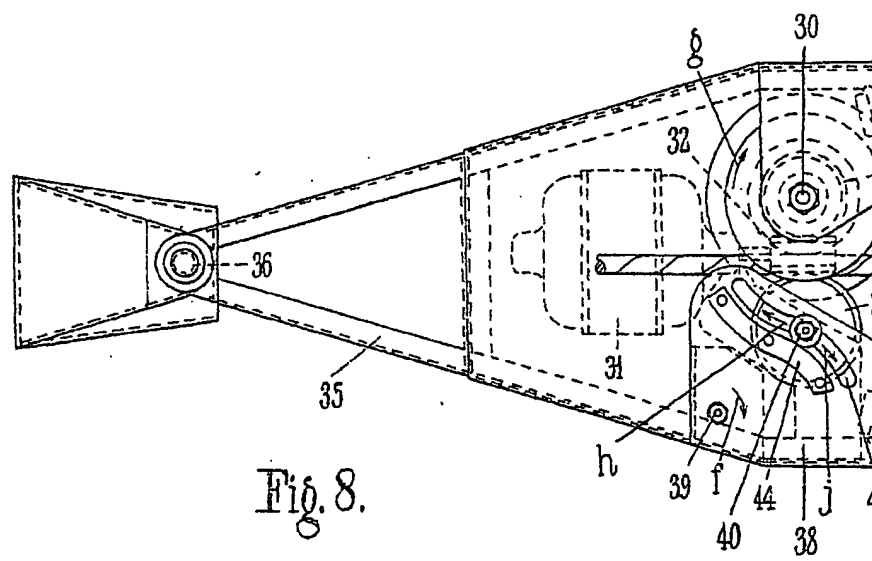
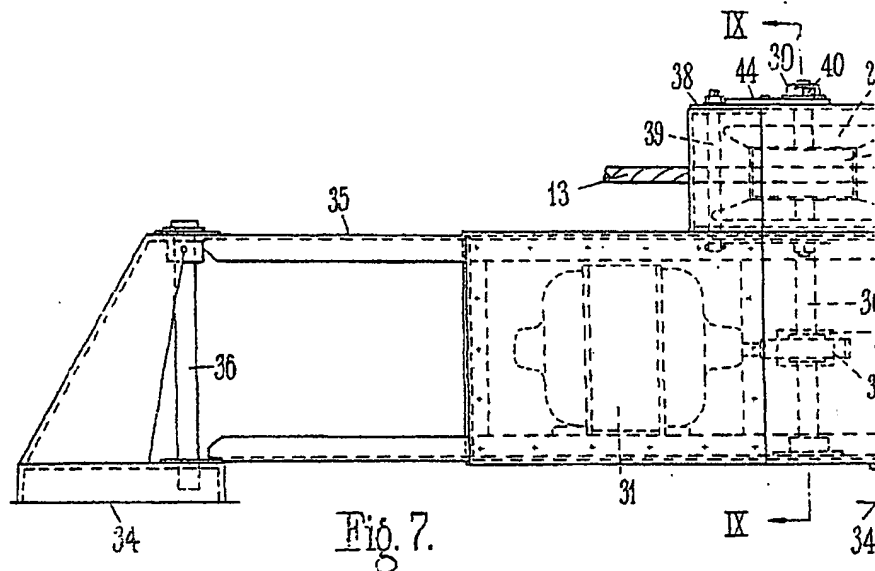


Fig. 6



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3 SHEETS

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the Original on a reduced scale.*

Sheet 3

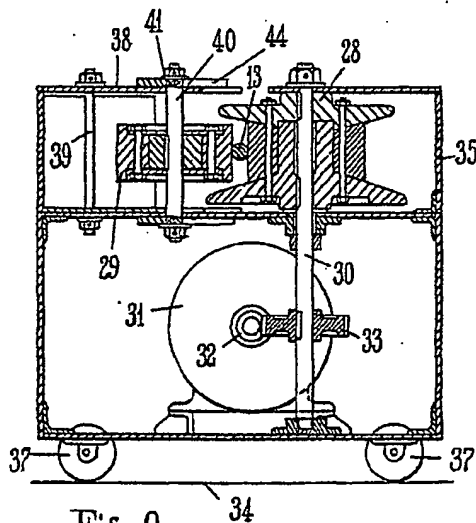
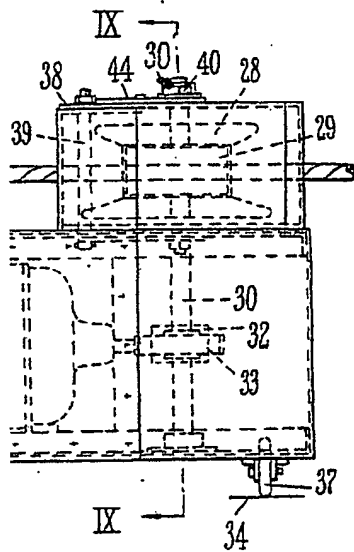


Fig. 9.

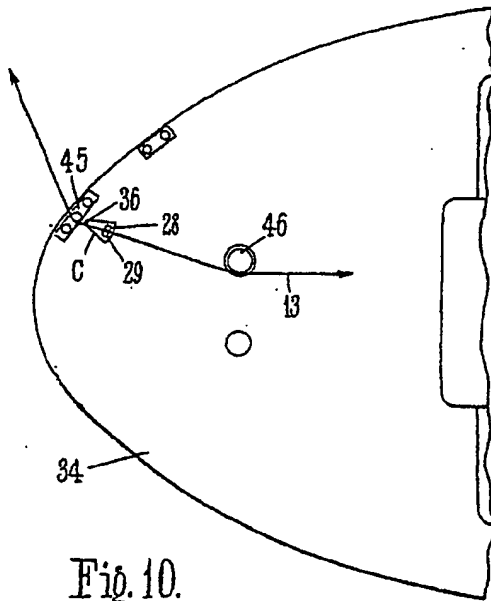
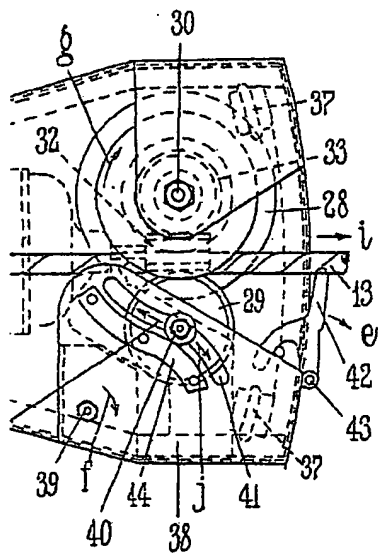


Fig. 10.



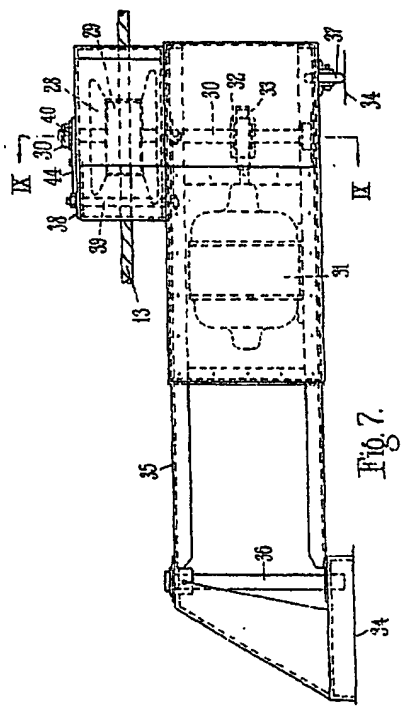


Fig. 7.

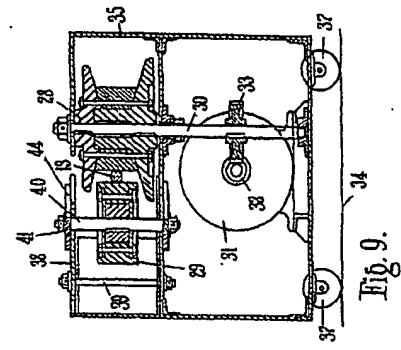


Fig. 9.

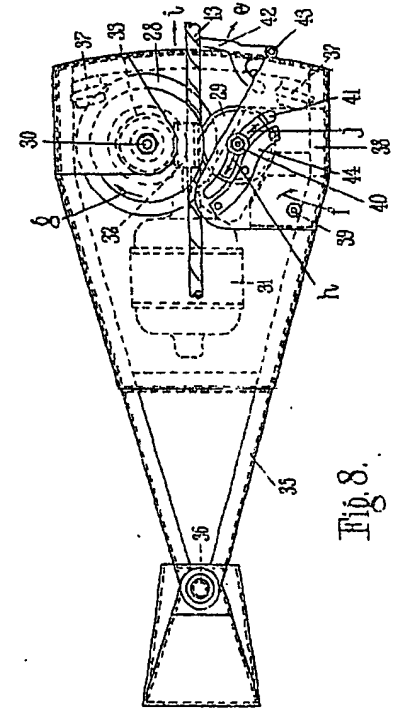


Fig. 8.

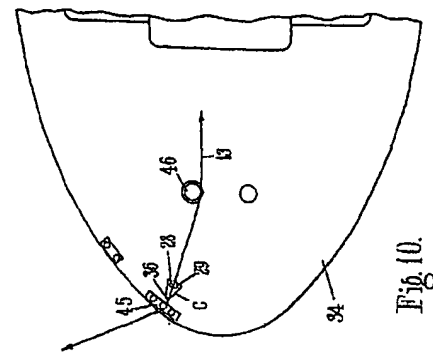


Fig. 10.